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RANGE IMPROVEMENT



NOTES

APRIL 1981

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U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE, INTERMOUNTAIN REGION
OGDEN, UTAH



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WATER QUALITY AND ITS RELATIONSHIP
TO RANGE LIVESTOCK

Paper presented at the 1980 Summer Meetings
AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS
San Antonio, Texas

by
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For several decades, range managers have recognized some of the roles grazing animals play in ecosystem management and manipulation (Stoddart, Smith, and Box 1975). The negative implications of livestock grazing are well known. During the last century and in the early part of this one, Western Ranges were severely overgrazed. With this abuse came secondary problems of accelerated erosion, decreased productivity, sedimentation, and lowered water quality. It is well to note, however, that not all incidents of accelerated erosion on wildlands are the direct result of overgrazing by livestock. Many land use practices can be abusive if improperly applied. This is true of overuse by wildlife, as in the classical case of the Kaibab deer herd (Storer 1953), improper logging or road construction practices, or excess human recreation traffic, as well as livestock overstocking.

Since the "dust bowl" era of the 1930's, and more specifically since the 1960's, the land management agencies have taken the lead in promoting a truer multiple use orientation for our public lands. Abusive grazing practices have been largely halted and a combination of uses, including forage production for herbivore use and watershed values, are now at least considered.

Not as well recognized, perhaps, are the beneficial aspects of properly managed livestock grazing. Several studies have indicated that under certain conditions, proper livestock management can induce even greater wildlife use. An example was reported by Anderson and Scherzinger (1975) in northeastern Oregon, where a complementary effect was seen between controlled livestock management and elk use. Aftermath grazing by cattle promoted subtle changes in vegetation structure and palatability which enhanced the attractiveness of the area for elk. Nor should economic considerations be overlooked. Many rural Western communities derive a major portion of their county revenues directly or indirectly from the livestock industry (Nielsen and Workman 1971). The social as well as economic implications of losing this revenue are tremendous. The sociological upheaval associated with relocating and retraining most, or even many, of the residents in such communities is, for all practical purposes, out of the question.

Finally, the fact that livestock numbers, turn-on and take-off dates, concentrations, and use patterns can be controlled to a large degree means that livestock may prove to be an important tool for ecosystem manipulation. As fuel costs increase and herbicide use declines, it also seems reasonable to explore using livestock as a manipulative tool for wildlife habitat,

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competition reduction within evergreen plantations, and other positive uses. As the world food crisis becomes more intense, we cannot afford to overlook the vast rangeland resources which provide sustenance to humans only through conversion by a herbivorous animal.

Livestock use on public land is obviously a double-edged sword. On one side, we see the importance of this activity, on the other, we recognize that improper use can be destructive and self-defeating. Nowhere is this more evident than along streams where livestock management and watershed management are often in sharpest focus. Livestock/watershed management implications are present over an entire grazing allotment. However, just as watershed management is often focused on the stream, range livestock management is frequently closely tied to streamside grazing.

Unfortunately, there is very little direct scientific information available on the relations between livestock management and watershed science. We recognize that cattle can and do break down streambanks, but as yet, we are unable to say precisely whether or not this activity is in excess of normal geologic activity for any given stream. Fortunately, some attempts are being made to determine the relative contributions from geologic and accelerated erosion (Skovlin and others 1977). Buckhouse, Skovlin, and Knight (In press) found no difference between the amount of streambank sloughing on managed versus control pastures in northeastern Oregon. Hayes (1978) in a study designed to determine relative differences in streambank erosion between a rest-rotation grazing system and a livestock-free meadow found that the livestock-free meadows actually lost more streambank to erosion than did the grazed meadows! Buckhouse and Skovlin suggested that in their study area, the overwintering effects of ice flows and high water ameliorated the differences which may have been present due to grazing practices alone. Hayes speculated that the ungrazed meadows were supporting vegetation that lacked the vigor which periodic pruning (burning, mowing, and/or grazing) provides and, therefore, were more susceptible to bank undercutting and sloughing.

In addition to addressing possible problems of erosion and sedimentation, we must recognize that increasing numbers of people are becoming concerned about other possible water quality implications from wildlands. Again, we have a very meager scientific data base on which to form our answers. It is apparent that streamside vegetation is important in controlling stream characteristics and temperature. Unfortunately, from a managerial point of view, we really don't know how much is necessary, what vegetative composition is best, or what degree of use can or should be tolerated. Apparently, however, if an area is in a healthy ecological state, it is capable of tolerating a managed livestock component. Claire and Storch (1977) discussed a stream in northeastern Oregon which was in a degraded condition due to a history of livestock abuse. A section of the stream was fenced to exclude livestock and for four years, it was allowed to recover. Since 1968, the area has been grazed under close supervision and the improvements in fish habitat and water temperature have been maintained. In this case, the grazing prescription was late season livestock use.

Bacterial concentrations and compositions are also important. Kunkle and Meiman (1967) observed that increases in coliform counts were noted when livestock grazed near the banks of the stream. In a much different, semi-arid

environment, Buckhouse and Gifford (1976) were unable to detect any significant changes in bacterial contamination associated with cattle grazing on an ephemeral watershed. One might speculate that at certain times of the year, bacterial loads may vary considerably. During low flow months, the only contamination may come from material which is defecated directly into the water. During the spring runoff, however, fecal material conceivably could wash from upland areas into the stream. Thus, timing of the various land uses may actually be as important as the use itself.

It is my conclusion that livestock are important, both ecologically and economically, in rangeland ecosystems. It is evident that there are circumstances where livestock grazing can actually be a tool to achieve other ends and additionally, with thoughtful management, many--if not most--of the deleterious side effects of livestock grazing can be avoided. As we enter the 1980's, it is evident that we must continue to strive for management and research which will enable us to use, yet retain, the heritage of our natural resources.

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RIPARIAN RESPONSE TO CERTAIN
GRAZING MANAGEMENT [3]

Paper presented at Society for Range Management
34th Annual Meeting
Tulsa, OK 1981

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ABSTRACT:

The concerns of forage production for livestock consumption, wildlife habitat, streambank erosion, fisheries, and water quality all seem to hinge on the critical riparian zones of wildland watersheds. Many user groups have vested interest in these areas, and the emotional fervor with which they defend their concerns can be awesome. This paper attempts to evaluate several scientific investigations and quantify the response of the riparian system to certain livestock grazing management practices.

IMPORTANCE OF RIPARIAN ZONES:

Riparian issues have become "buzz words" in natural resource planning. Recognition of riparian zones as the focal point of watershed, wildlife, recreation, and livestock production concerns is now fairly common. Satterlund (1972) in his book Wildlife Watershed Management emphasized land uses and their impact on quantity, quality, and timing of streamflows, which has a direct relation to riparian zones. Thomas (1979 p. 41) pointed out the importance of riparian zones to wildlife by stating that "of the 378 terrestrial species known to occur in the Blue Mountains, 285 are either directly dependent on riparian zones or utilize them more than other habitats." He further pointed out that stream margins are disproportionately important for forest and range uses, with these margins frequently containing the most highly productive timber and forage sites. Roath (1980) found that cattle use in a forested grazing allotment in eastern Oregon was disproportionately heavy in the riparian zone. In his study location, 1.9 percent of the land area was classified as riparian and yet it accounted for 81 percent of the herbaceous vegetation removed by livestock. Wildland recreation is also closely correlated to water; with favorite campsites, fishing, frolicking, and scenic values often found in association with riparian zones.

Perhaps the most obvious conclusion one can draw from looking at the literature is that there is a dearth of scientific information appropriate to this issue. This does not imply that we are without knowledge in this area, but one must recognize that much of what we have been able to glean comes from observation of isolated, and frequently nonreplicated, demonstrations.

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The obvious importance of these zones has sparked considerable interest and volumes of reports, studies, and opinions. In this particular paper, I shall focus on several livestock grazing implications in riparian zones.

DEGRADATION DUE TO ABUSIVE PRACTICES:

Meehan and Platts (1978) published an article quantifying many of the known relationships between livestock grazing and water quality, quantity, and fish habitat. Through use of some sixty papers which they cited, they demonstrated an obvious deleterious relationship between the riparian system and abusive grazing. It is clear that significant negative changes have been brought about by overgrazing. What is less clear, however, is what constitutes overgrazing on any given system; to what degree geologic events are operating independent of grazing; and what ameliorating effects might grazing systems, season of grazing, and animal behavior modification have. These questions need to be quantified and answered before land managers will be able to fully understand and allocate the resources entrusted to them.

SEASON OF USE:

One of the landmark riparian zones about which one often hears, at least in the Pacific Northwest, is Camp Creek, located in northeast Oregon's Blue Mountains. A riparian restoration effort on Camp Creek involved the fencing of a stream corridor and periodic observation of the resulting changes. Claire and Storch (1977) noted that when Camp Creek was fenced in 1964, the streamside was void of a shrub canopy and exposed streambanks were common. They reported that by 1974, though the condition of the stream outside the fenced section remained unchanged, inside alder and willow shrub canopy was providing up to 75 percent shade to the stream. They further noted that maximum water temperatures outside and downstream from the fenced area averaged 12 degrees Fahrenheit higher than those samples taken within the fenced area. They found that daily water temperature fluctuations averaged 27 degrees outside compared to 13 degrees inside the fenced area. Fish composition was such that within the fenced area, game fish made up 77 percent of the population while game fish comprised only 24 percent of the fish population outside the fence. Since 1968, Camp Creek has been opened to livestock grazing again. The fenced area now serves as a special-use pasture, providing late season (after August 1) livestock grazing which is carefully monitored. In the ten years since grazing has been reintroduced, the authors reported that no measurable change in fish population had been identified as a result of this type of livestock use. These observations, though not replicated and rigid, serve to make me believe that riparian zones have a remarkable ability for rapid recovery; and once in good condition, they are capable of supporting managed livestock grazing. In this case, late season use was the prescription.

GRAZING SYSTEMS:

Hayes (1978) studied three meadows and their associated streams in the Idaho batholith. One of these meadows was ungrazed and two others were grazed under a rest-rotation grazing management system. He reported that rest-rotation grazing in the meadows did not significantly alter channel movement. He found

that occurrence of degradation during spring discharge along ungrazed streambanks was significantly greater than degradation occurring along the grazed streambanks. Hayes suggested that ungrazed or unburned meadows may in fact suffer from a lack of vegetative vigor, and thus be susceptible to undercutting. He noted, however, that some degradation, attributable to livestock during the grazing season, was present in the grazed meadows.

Johnson (1965) reported that season-long grazing in mountainous areas had been found to increase use of the meadows, and especially the riparian zones, into the latter part of the season. Hayes (1978) speculated that since the probability of bank degradation increases as livestock concentrations intensify along streambanks, especially late in the growing season when the vegetation is reaching maturity, that a rest-rotation livestock system would avoid such concentrations at critical times.

Buckhouse, Skovlin, and Knight (In press) investigated a number of livestock grazing practices on Meadow Creek in the Blue Mountains of Oregon and discovered that the relative stability of that system was not statistically changed following two years of systems grazing at a level of 3.2 ha/AUM. They reported that the grazed treatments experienced a sloughing of cutbanks at the rate of 16 and 14cm per year during 1976 and 1977, respectively. During the same period, cutbanks in ungrazed, control sections lost 11 and 8 cm annually. While in both cases, the grazed units showed higher mean annual erosional losses, the differences were not significant ($P < .10$). They also observed that higher streambank erosional rates were associated with the winter months than during the summer grazing period regardless of whether these were grazed or ungrazed treatments. As a consequence, they concluded that at that particular grazing rate, the over-wintering processes associated with high water and ice flows were agents that were at least as important in streambank erosion as the perturbations associated with the livestock.

STREAMSIDE VEGETATION

Roath (1980) noted that the riparian zone accounted for a disproportionate amount of forage production and consumption, yet he reported the streambanks to be stable in his study location near John Day, Oregon. Roath noted that Kentucky bluegrass (*Poa pratensis*) was the dominate grass in that riparian zone and speculated that it exerted major control over the relative stability of the associated vegetation communities. He concluded that since Kentucky bluegrass has been demonstrated to be highly tolerant to defoliation, grazing at an intensity such as to reduce and maintain the grass at a stubble height of about an inch had small impact on vigor and cover.

In addition, Roath noted that those riparian zones which were deferred until late August showed a much lower livestock utilization on the herbaceous component. He speculated that this was attributable to a combination of low palatability relative to that found on shady slopes and cold air accumulation on the meadows. He suggested, therefore, that utilization of herbaceous componenets in the riparian zones could be manipulated by changing seasons of use, matching relative succulence and palatabilities of the hillside and riparian vegetation.

ANIMAL BEHAVIOR

In a separate analysis, Roath (1980) also investigated cattle behavior patterns. He found that the livestock, much like big game, have a distinct home range. Of the animals studied, one group had a home range which encompassed only upland areas. While additional work is necessary to more fully quantify the social structure and learning processes associated with choosing these home ranges, it is interesting to consider the ramifications of this. For example, would it be possible through breeding, training, and/or herd culling practices to establish a group of animals who actually preferred and selected upland rather than riparian sites while foraging?

CONCLUSIONS

I believe that several observations can be drawn from these studies:

First, I think it is clear that riparian zones are important focal points for most of the products and uses associated with many natural ecosystems.

Second, it has been shown that abusive land use practices can result in a degradation of these areas. Abusive practices which cause such degradation could be improper forestry practices, grazing, road construction, or farming.

Third, the inherent capacity for recovery of degraded riparian zones is remarkable. This may be due to vegetation such as the Kentucky bluegrass which is exceptionally tolerant of heavy use and provides considerable stability for the system. Or it may be a function of the rich nutrient and soil resource or relatively higher moisture availability which is associated with this zone.

Fourth, it appears that by exercising the appropriate managerial tools which are available to range managers--tools such as control of grazing intensity and season of use--livestock grazing can be compatible with the other uses and values germane to these unique and important areas.

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